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DESCRIPTION OF *OSMIA CAHUILLA*, N. SP., RECOGNITION OF THE MALE OF *O. GABRIELIS* SANDHOUSE AND THE LIKELY FEMALE OF *O. BRIDWELLI* SANDHOUSE (APOIDEA, MEGACHILIDAE)

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Abstract.—*Osmia* (*Monilosmia*) *cahuilla,* n. sp. is described from the offspring of a typical female of *O.* (*M.*) *bridwelli.* Her sons are distinct from the holotype and paratype males of *O. bridwelli.* The probable male of *O.* (*M.*) *gabrielis* is briefly diagnosed; reasons are provided for considering *O. bridwelli* to be the male of *O.* (*M.*) *cara* Cockerell. Features separating male *O. cahuilla* from each of the known or tentatively assigned males of other large, montane *Monilosmia* females are listed.

Key Words: *Osmia, Monilosmia,* correlation of sexes, synonymy

On Mt. San Jacinto, Riverside Co., CA, from time to time in the spring of 1990, a very large, very dark female *Osmia* was seen to fly to a rift in the shaded junction between bark and wood of an old insect-ravaged pine stump. The bee would disappear in an instant between the slightly loosened bark and wood, remaining within for considerable periods of time. I did not capture the *Osmia* later in spring, nor did I disturb the nesting site, but marked that portion of the crevice used by the bee as entrance to the stump.

I removed the completed nest in October of that year. It proved not only of unusual structure, unlike any so far described for other species of *Osmia,* but contained male and female offspring of the easily recognized female of the infrequent bee known as *Osmia* (*Monilosmia*) *bridwelli* Sandhouse (1939). However, the sibling males from the nest are entirely distinct from the male holotype and male paratype of *O. bridwelli,* despite their sisters' identity with the allotype and the three other female paratypes of *Osmia bridwelli.* The male occupants of the nest and their sisters therefore represent an unnamed species.

Here described are the two sexes of *Osmia cahuilla,* n. sp. and their taxonomic differentiation from other large, so-called *Monilosmia.* The strong likelihood is discussed that the true *O. bridwelli* (the male) is a junior synonym of *O. cara* Cockerell (1910), known only from females.

CONVENTIONS

The numerical data presented are the observed range ($\overline{or}$) within the sample, the sample mean (= $\bar{m}$), and Haldane's (1955) unbiased estimate (V*) of the coefficient of variation (V) of the sample; namely, $V^* = V(1 + 1/4n)$.

Twenty female specimens of *O. cahuilla* were available (the 4 female paratypes of Sandhouse's *O. bridwelli,* + 5 from the nest and 11 field-collected). The sample size for female measurements is 20 if no other number (n) is given; when less than 20, a subscript to n indicates the number of Sandhouse's paratypes in that sample. Males

available for measurement were 16 (13 from the nest, 3 field-collected).[1] If the sample includes less than 16, n is given. Males or females omitted from samples were those in which the particular character could not be measured.

Because many specimens of both sexes caught in the field had lost the apices of their wings, or the distal region was bent, the measure of wing length (L*) used is that of Shinn (1967), namely: the distance along the costal margin from the apex of the costal sclerite to the discontinuity between prestigma and stigma—almost always a length measurable on at least one side with reasonable accuracy and good precision.

The measure of body length in females is the sum of the lengths of head (anterior to posterior surface at level of antennal insertions), meso- and metasoma; at best it is only a possible size of the living bee. That of males is a derived estimate. Because 15 of the males had the metasoma maximally stretched to permit study of the sternites without dissection, only one unstretched male could be measured. Its body length was 2.53 × L*. Multiplication of each individual measure of L* by 2.53 gave the figures for which the statistics of male "body length" are provided. Necessarily, V* is the same for both L* and "body length." The resulting dimensions of males are minimal, and certainly less reliable than those for females. However, they are not out of line with published sizes of large *O.* (*Monilosmia*) species having females of similar size to that of *O. cahuilla*, n. sp.

Head length was measured medially from the apical margin of the clypeus to the vertex. The external limit of a compound eye was taken as the outermost row of ommatidea; that of an ocellus is the outer rim of its lens. The intertegular width was measured between the anterior ends of the tegulae.

The width of the fimbriate emargination at the apex of sternite-III, after several trial methods, proved best given as the distance between the outermost base of the left- and right-most tuft of distal fimbria at the level of the rim of the emargination. The depth of the emargination was obtained by placing a short, straight length of fine hair (20 μ in diameter) tangent to the apices of sternite-III immediately to each side of the emargination, then measuring the shortest distance from the proximal mid-point of the emargination to the bounding margin of the hair. The "width" of a sternite proved best represented by the easily measured distance between the distal ends of its gradulus.

Michener's and Fraser's (1978) terminology is used for description of the mandibles. Puncta are said to be large when of greater size than those medially on the anterior third of the mesonotum.

Finally, I follow Riek (1970) and Naumann in the two editions of the Insects of Australia (see Naumann 1991, pp. 923–924), in their use of "terminalia" for the sclerotized copulatory organs of Hymenoptera (or their homologs), rather than "genitalia." The male terminalia are in effect the median, unpaired intromittent organ, in *Osmia* consisting of not less than five sclerotized elements. Accordingly, I use the plural form.

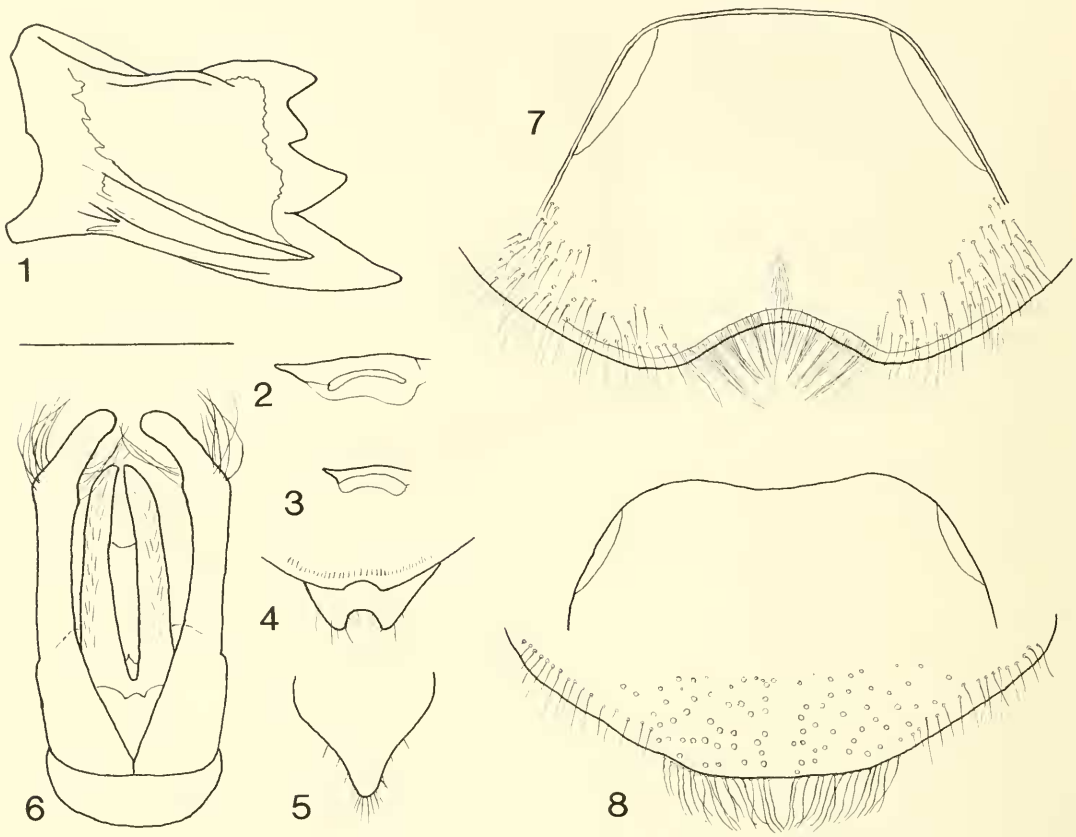
Osmia cahuilla Cooper, New Species
(Figs. 1–8)

In part, females only, *O. bridwelli* Sandhouse 1939, p. 100.

Male (n = 16).—Length (L) (see conventions), observed range (= $\overline{or}$) = 7.7–10.6 mm, $\bar{m}$ = 9.6 mm, V* = 7.4. Forewing L*, $\overline{or}$ = 3.0–4.2 mm, $\bar{m}$ = 3.8 mm, V* = 7.4. Intertegular width (W), $\overline{or}$ = 2.1–2.8 mm, $\bar{m}$ = 2.5 mm, V* = 6.6.

Integument dorsally and laterally dark

[1] Thirteen males were pinned at the time the nest was opened. When preparing a fragment of the nest for display in the spring of 1991, an additional three males were discovered dead within their cocoons. The three cells with their enclosed occupants have each been mounted on a pin. These three males are included among the paratypes, but not in the measured series.



Figs. 1–8. *Osmia cahuilla* n. sp. 1, Female mandible. 2, Female strigilis. 3, Male strigilis. 4, Distal ends of male tergites VI and VII. 5, Male sternite VIII. 6, Male terminalia. 7, Male sternite III. 8, Male sternite IV. Bar = 1 mm. (Note: Setal patterns and sculpture of more proximal regions are not indicated in Figs. 7, 8; drawings semi-diagrammatic, made from camera lucida sketches.)

blue; sternites(st)-I, II blue, III and IV blue on apical thirds. Anterior margin of clypeus black; mandible black, greenish-blue reflection at base; antennal scape, pedicel black, flagellum piceous to black. Tegula with metallic luster; forewing light brown, hind wing less so, veins black to brown; legs black, coxae, femora, tibiae with a bluish sheen.

Pubescence of clypeus and face long, dense, white, some black hairs; on vertex and gena long, largely or entirely black; on posterior gena long, dense, white. Mesonotal and scutellar hairs long, whitish, some black, on flanks dark sooty. Femora-I with dense, very long white hair, few black; on femora-II, III and tibiae-I, II, long hairs sparser, black or blackish, some *bicolorous* (namely, whether light or dark depends on angle of incident light); tibiae-III long hairs black; plantar setae of basitarsi mostly ferruginous. On propodeum and tergite-I long white hairs, few black; remainder of metasomal dorsum with suberect black hairs, those along proximal margins of impunctate bands bicolorous. On sternites mixed, hairs overlain by preceding sternite and fimbria of st-III emargination bicolorous, apical fringe of st-IV black.

Head (W) : (L), $\overline{or}$ = 1.14–1.21, $\bar{m}$ = 1.17, V* = 1.8. Maximum W(gena) : max W(eye), $\overline{or}$ = 0.75–0.92, $\bar{m}$ = 0.87, V* = 4.6. Least distance (D) (eye to lateral ocellus) : D(lat

ocel–occiput), $\overline{or}$ = 1.25–1.61, $\bar{m}$ = 1.42, V* = 7.0.

Clypeus convex, closely, finely punctate, apical margin polished, arcuate, not thickened, widest medially (*ca.* 6–8 puncta diameters), variably crenulate, a low median papilla (lacking in 1). Labrum closely punctate apically and laterally, bounding medial polished area. Eyes convergent below. Punctation of upper face, vertex, gena, postgena, dense, larger than clypeal puncta.

Hypostomal carina: Height ~0.5 W(antennal pedicel), gradually reducing to <0.5 from highest point to distal end, obtusely reduced before angle by ~0.5.

Mandible: Distal angle between apex and pollex clearly less to nearly 90°, acetabular carina weak, condylar ridge somewhat to moderately wider than outer ridge (but condylar ridge much wider in 1).

Maxillary palpi 5-segmented, 3rd article subequal to 4 + 5. Labial palpi L(article-1) : L(art-2), $\overline{or}$ = 0.69–0.83, $\bar{m}$ = 0.73, V* = 5.0, n = 15.

Mesonotum dull, discal puncta small, closer than on vertex; scutellum with larger, well-spaced puncta medially; mesopleural puncta close-set. Metanotal puncta widely spaced, interspaces strongly microsculptured. Propodeal triangle dull, with tortuous rugosities above, minute strigosities below.

Wing papillae separated *ca.* 2+ diameters. Inner margin of malar spine oblique to apical margin of velum, shorter than W(malus) at apex of velum (Fig. 3). Hind coxae subcarinate in 12 individuals. Calcars fairly stout (the posterior more so), narrowing toward tip, slightly bent near apex. Hind basitarsi widest near apical fifth ($\overline{or}$ = 0.17–0.29, $\bar{m}$ = 0.22, V* = 15.0), a weak semblance of a low, elongate tooth may be present at widest region (in 4 individuals only; on both sides in 2, on one side only in 2).

Metasoma: At 50× magnification shape of main puncta of tergites (t) depends on angle of incident light—may appear to have an anterior raised rim, a widening furrow behind, or be granular; the large puncta spaced 1 to 2 diameters, closest on t-IV, largest before concavity on t-VI; interspaces shining, with sparsely scattered micropuncta. Impunctate bands (IB)-I 0.5 W(antennal pedicel), IB-II through V subequal to W(pedicel); all IBs metallic, microsculptured. T-VI, VII concave in profile; t-VI shallowly emarginate in 13 males; t-VII (Fig. 4) with a deep emargination (shallow in one), apical angles acute.

Distal margin of st-II arcuate, rim translucent brown. St-III, median emargination very variable, W(between outermost fimbrial tufts) : D(between ends of gradulus), $\overline{or}$ = 0.36–0.47, $\bar{m}$ = 0.42, V* = 8.0. Depth of emargination : (W), $\overline{or}$ = 0.21–0.31, $\bar{m}$ = 0.25, V* = 12.8. Fimbrial hair axes normal to emarginate rim, converge apically as tufts, extend medially beyond apices of st-III (Fig. 7). St-IV (Fig. 8), posterior third of disc coarsely, sparsely granulate, strongly microsculptured, apically subtruncate (convexly arcuate in 3 males) with apical fringe of erect, subparallel, long setae, tips bent mesad, bases normal to subtruncation, axes parallel to surface of st-IV; fringe interrupted medially by a bare, broad, medial band extending from apical margin to proximal limit of blue integument, band defined by granular bases of suberect setae. Distal margin of st-VI with a subhemicircular apical lobe, lobe with sparse, short, stout, erect piceous setae, some hamate. St-VIII (Fig. 5), apical third very variable, often somewhat inwardly sinuate to each side before tip.

Terminalia (= "genitalia" of authors), (Fig. 6): Similar to some other large *Monilosmia* (see Sandhouse 1939, figs. 234, 235); subapical flexure of gonoforceps angularly bent on lateral margin not markedly expanded subdistally, setae of lateral cluster always more numerous than inner cluster (both vary greatly); lateral dorsal surfaces of parapenial lobes with numerous semi-erect to recumbent, apically directed golden hairs.

Female (n = 20).—Length (= L), $\overline{or}$ = 11.0–14.0 mm, $\bar{m}$ = 12.8 mm, V* = 8.5. Forewing L*, $\overline{or}$ = 4.3–5.0 mm, $\bar{m}$ = 4.8 mm, V* = 5.9. Intertegular W, $\overline{or}$ = 3.11–3.9 mm, $\bar{m}$ = 3.6 mm, V* = 6.5.

Integument: Almost black to dark purplish-blue, or blue. Clypeal margin, mandible, scape, pedicel, flagellum as in male, wings and veins darker. Legs black. Setal tufts below clypeal margin from orange to black. Pubescence black, smoky black to black on sides of mesosoma, on propodeum, and metasomal tergite-I. Setae of wings black to brown, of legs black, rusty-brown to black beneath foretarsi. Scopa black.

Head(W) : (L), $\overline{or}$ = 1.13–1.19, $\bar{m}$ = 1.16, V* = 1.6. W(gena) : W(eye), $\overline{or}$ = 1.32–1.60, $\bar{m}$ = 1.43, V* = 5.2. Least distance (D) (lateral ocellus–eye) : D(lat ocell–occiput) subequal, $\overline{or}$ = 0.89–1.05, $\bar{m}$ = 1.00, V* = 4.5.

Clypeus convex, truncate, or slightly incurved apically, densely punctate, apical margin subequal to D from lateral angle of truncation to end of epistomal suture, $\overline{or}$ = 0.86–1.16, $\bar{m}$ = 1.00, V* = 7.5, impunctate margin 2–4 puncta wide, setae proclinate; fronto-clypeal suture marks boundary above which facial setae are erect or bent posteriorly; puncta below each side of clypeus large, well-separated, contrast with smaller, closer-set puncta of clypeus and paraocular area and frons above. A narrow, shiny, impunctate medial strip extends between lateral ocelli to vertex. Eyes slightly convergent below. Postgenal setae long, tips curl mesad over hypostomal carina. Carina high, abruptly reduced to 25–60% at angle, very variable; tooth $\leq$90° in 14 of 19_3 females.

Mouthparts: Mandible 4-dentate (Fig. 1), D(apex to inner tooth P_3) subequal to L of base, narrowest at about 0.33 L from condylar insertion, measured along ventral edge in ventral view; P_3 stouter, larger than P_2 below, L(P_1) ~1.5 × P_2, L apical tooth ~2 × P_1; angle between P_3 and P_2 obtuse, others acute. Condylar ridge ~2× as wide as outer ridge, convergent. Maxillary palp with 5 articles, L(article-3) : L(4 + 5), $\overline{or}$ = 0.64–0.85, $\bar{m}$ = 0.75, V* = 9.1, med = 0.77, n = 17_3. Labial palp, L(article-1) : L(art-2), $\overline{or}$ = 0.71–0.81, $\bar{m}$ = 0.75, V* = 3.9, n = 17_2. Dorsal, lateral and outer margin of galea with stout, erect, setae angularly bent to ~90° at apical third (at length subequal to article-3 of maxillary palp); except at base, setae are of very similar lengths for 0.5 L(galea), then increasingly smaller, most apical not bent.

Mesosoma: Punctation resembles that of females of *O. cara* Cockerell, *O. densa* Cresson, and *O. gabrielis* Cockerell; lower 0.5–0.33 of propodeal triangle polished, or dull with microrugae. Tegulae coarsely, irregularly punctate. Wing papillae separated 2 or 2+ diameters. Malar spine long, acute (Fig. 2).

Metasoma: Puncta of tergites-I to IV small near gradulus, enlarging distally and appearing shallowly furrowed in oblique light; interspaces polished, sparsely micropunctate, those of t-V appearing granulate; t-VI densely punctate, slope nearly straight in profile, a narrow sulcus before apical flange. Inner margins of impunctate bands (IB) of t-I to V (of all females) widen medially (t-III least so) forming an angle; to one side of widening, W(IB-I) < W of antennal pedicel (= wp), others <2 wp (n = 20). IB-I polished, IB-II and III shiny, with sculpture or not, IB-IV and V always microsculptured; all IBs behind first microsculptured one are increasingly sculptured.

Etymology: "Cahuilla" is the name of the Indians of southern California known to have hunted acorns, berries and game on the slopes of Mt. San Jacinto. That very appropriate name is given in gratitude for the courtesies granted my endeavors by the Agua Caliente Band of Cahuilla, especially by Tony Andreas.

Types.—Holotype, male; paratypes: female allotype plus 4 sisters and 16 male siblings. All 21 bees from a single nest within the bark of a yellow pine stump (taken on 21 October 1990) at the type locality, 1500 m, near Azalea Creek, Vista Grande

road (3S08), Mt. San Jacinto, Riverside, California (Banning Quadrangle, Sec. 9, T4S, R2E). The holotype and allotype siblings are deposited in the U.S. National Museum of Natural History (USNM).

Field collected (my label dates record the month by a single letter, with the months in alphabetic sequence; thus A or a = January, E or e = May, etc.; 82 G 7 accordingly is 7 July '82): 82 G 7, 2 ♀♀, Coon Creek, 2300 m, Mt. San Gorgonio, San Bernardino Co., CA; 84 F 28, 1 ♀, Rattlesnake Trail, N of Eagle's Roost, 1900 m, Los Angeles Crest Hwy, Los Angeles Co., CA; 86 F 10, 1 ♀, Sta Rosa Mtn, 2300 m, Riverside Co., CA; 86 F 21, 1 ♀, Dawson Saddle, 2400 m, Los Angeles Crest Hwy, Los Angeles Co., CA; 90 D 17, 1 ♂, Vista Grande, 1500 m, Mt. San Jacinto, Riverside Co., CA; 90 D 26, 1 ♂, same locality as preceding; 90 E 9, 1 ♀, 1 ♂, vicinity of Azalea Creek, Mt. San Jacinto, Riverside Co., CA; 90 F 19, 1 ♀, Mountain Rd 50, 2000 m, Sequoia National Forest, Tulare Co., CA; 91 F 4, 2 ♀♀, Vista Grande, 1500 m, Mt. San Jacinto, Riverside Co., CA; 91 F 6, 2 ♀♀, same locality as preceding.

I have found *O. cahuilla* in the mountains not far from a seep, spring, or stream, at the shrubby margins of moderately open woodland, less frequently amid chaparral, and at best in small numbers only.

The following are additional records of *O. cahuilla*: V.29.11, 2 ♀♀ (paratypes of *O. bridwelli*), Siskiyou Co., CA—F. W. Nunnemacher collector; July – 1912, 1 ♀ (allotype of *O. bridwelli*), San Jacinto Mts., Riverside Co., CA—J. C. Bridwell; no date, 1 ♀ (paratype of *O. bridwelli*), Nevada—collector ? (Sandhouse 1939).

Moldenke and Neff (1974)[2] list only the California county of origin of the bees they examined when searching for records of floral visitations by *O. cahuilla* (as "*O. bridwelli*"), thus: 18 ♀♀, Mariposa Co., 9 ♀♀, Sacramento Co.; 2 ♀♀, Riverside Co. From my flower records the following are to be added: *Lotus grandiflorus* (Benth.) Greene (2 ♀♀), *Lupinus excubitus* Jones (3 ♀♀), *Phacelia imbricata* Greene (1 ♀), and *Ribes nevadensis* Kell. (1 ♀, 1 ♂), giving a total species-list of 22 flowers, representing 16 genera among 10 families. Whether any of these nectariferous flowers provide *O. cahuilla* with pollen is not known, though likely. Such seeming polytropy awakens the question as to whether the unusual, strongly bent, galeal setae are now functionally significant or merely a relic from earlier times. Certainly they are not necessary for taking nectar, and the strange orientations of the setae on the galea (see below) do not suggest that they are efficient pollen-scoops.

Differentiation of *O. cahuilla*, n. sp. from other large *Monilosmia*

Among other, less well-defined attributes, the male holotype and paratype of *O. bridwelli* Sandhouse differ from *O. cahuilla* by having: antennal articles 3 through 11 brown; the polished surface of the anterior rim of the clypeus somewhat thickened and weakly, outwardly curved in cross-section; labrum very coarsely punctate, impunctate basally only; a scattering of long black hairs anteriorly on genae, remainder white; no vestige of a lengthwise carina on posterior coxae; at most a very faint metallic sheen to tibiae; hind basitarsi with a very strong subapical tooth on ventral margin; rim of tergite-VI translucent; sternite-IV arcuate apically, dull, with small, closely-set granulations (= setal bases) over apical third, apical fimbria pale, tips of setae not bent near tips, fimbria not interrupted medially by a broad, lengthwise asetose band (*cf.* Fig. 8).

Attributes which readily distinguish males of other large species of *Monilosmia* from *O. cahuilla* include: (1) for *O. atrocyanea* Cockerell, the white pubescence of its mesosomal flanks anteriorly, becoming sooty-

[2] A very useful work not cited in the Catalog of the Hymenoptera of America North of Mexico, Vol. 2, 1979. The list of flowers in the catalog (Hurd 1979, p. 2047) is identical with that of Moldenke and Neff.

black posteriorly and on sides of the propodeum; the sub-triangular emargination of st-III; and above all, its striking male terminalia (*cf.* Sandhouse 1939, fig. 238 with fig. 4); (2) for *O. densa* Cockerell, its very low, nearly uniform hypostomal carina; pubescence of mesosomal flanks and propodeum white (a few dark hairs in some); hind basitarsal tooth strong; st-IV truncate on apical third, surface dull; (3) for *O. gabrielis* Cockerell, its posterior projection of the mandible at the condylar insertion similar to but less pronounced than that of female *O. gabrielis*; pubescence of mesosomal flanks white anteriorly, sooty-black hairs behind continuing onto the lower propodeum; hind basitarsal tooth strong; emargination of st-III deep, subtriangular; (4) for the more northern *O. juxta* Cresson (with male ? = *O. theta* Sandhouse 1924, 1925, 1939) its femora and tibiae black; pubescence of mesosomal and propodeal flanks white; hind basitarsal tooth large; st-IV very broadly truncate (*ca.* 0.5 its width). (5) Should *O. enena* Cockerell prove to be the actual male of *O. juxta* Cresson[3], then it would strikingly differ from *O. cahuilla* males by its black legs (Cockerell 1907), its well defined triangular patch of coarse setae on st-IV, and by the two widely separated clusters of setae on the medial, subapical aspects of the gonostyli, as well as by the much larger brushes of subapical setae on their lateral aspects (*cf.* fig. 256 in Sandhouse 1939 with fig. 6; in her text Sandhouse states that the ". . . genitalia are very similar to those of *collinsiae.*").

The female of *O. cahuilla* is easily separated from all other "*Monilosmia*" females, large and small, by the distinctive bristles occurring *only* on its galea. Very stiff, erect, smoothly but abruptly bent at their distal thirds, tapering thereafter to their tips, these bristles are well-spaced, but irregularly so, with their tips oriented nearly haphazardly (pointing posteriorly, medially, obliquely and anteriorly in no obvious pattern). One of Sandhouse's (1939) paratypes of *O. bridwelli* from Siskiyou Co. shows this very well, the Nevada specimen does so fairly well (mouthparts not extended); the remaining two paratypes are in poor condition, retaining but few bent bristles.

The much smaller, more slender females of *O. sculleni* Sandhouse and *O. rostrata* Sandhouse, currently placed in "*Monilosmia,*" and *O.* (*Chenosmia*) *illinoiensis* Robertson, also have characteristic bent hairs or bristles on their maxillae, but in addition such bent bristles or hairs occur on articles-1 and 2 of the labial palps, and a few on the maxillary palps as well. Females of *O.* (*Nothosmia*) *mixta* Michener (1936, 1949) resemble *O. cahuilla* by having bent bristles on the galea only; it is, however, a smaller, white-pubescent bee having tridentate mandibles.

A remotely related Palaearctic *Osmia* (*Melanosmia*) *pilicornis* Smith has hooked hairs on the maxillary palps similar to those of *O. cahuilla,* but evidently more regular in arrangement (see Tkalcú 1983, fig. 11). According to Michener's (1941, 1943, 1947) widely accepted concepts of the Osmiinae, the five Palaearctic species of "*Osmia*" having hooked hairs on their mouthparts, discussed by Parker and Tepedino (1982), in fact belong in *Anthocopa* (subg. *Haetosmia,* 3 spp., see Popov 1952a, b) and *Hoplitis* (subg. *Tridentosmia,* 2 spp., see Popov 1952b) and are now so catalogued (van der Zanden 1988).

The Status of *Osmia* (*Monilosmia*) *bridwelli* Sandhouse 1939

The previously undescribed male of *O. gabrielis* Cockerell (1910) is sufficiently

[3] *O* (*M.*) *albolateralis* Cresson, with smaller females than *O. cara,* was held by Sandhouse (1939) to have *O. enena* Cockerell as its possible male. However, in his letter of 11 November 1939 to P. H. Timberlake, Cockerell states "Grace Sandhouse, when here, went over my collection, and now holds to the following synonymy, different from that of her book . . . *enena* Ckll = *juxta* Cr. . . ." That is but one of eleven changes in her decisions which Cockerell lists in that letter. Sandhouse (1939) held *O. theta* Sandhouse (1925) to be the male of *O. juxta.*

characterized above to allow recognition. There now remains but one among the largest montane *Monilosmia* for which no male has been described, *O. cara* (Cockerell 1910), locally frequent in montane California (from Siskiyou Co. where the male paratype of *O. bridwelli* was collected, to San Diego Co.).[4]

The type locality for *O. bridwelli* is Strawberry Valley (~1650 m alt.) on Mt. San Jacinto, Riverside Co., California. It is well within the altitudinal range of *O. cara* on Mt. San Jacinto, Santa Rosa Peak, Mt. San Gorgonio, and the San Gabriel mountains (1200–2450 m), each of which provides similar habitats of chaparral and shrubby areas adjoining open woodlands of a sort in which *O. cara* females are to be found. *O. bridwelli* is of appropriate size, coloration, habitus, and similar habitat to be the male of *O. cara*. Just as male *O. gabrielis* have a small but distinct posterior projection of the mandible at the condylar insertions, less pronounced than that unique attribute of its female, so the holotype and paratype of *O. bridwelli* have a somewhat swollen anterior clypeal margin, unlike those of the males discussed earlier. It is notable that a strong thickening of the clypeal apex is a distinctive feature of female *O. cara*, though not mentioned by Cockerell (1910).

P. H. Timberlake's collection, at the University of California, Riverside, includes a series of 43 specimens identified by him as *O. cara*. Remarkably, 10 of these are males (4 *ex* Madera Co., 3—Tulare Co., and 3—San Bernardino Co.), all of which run directly to *O. bridwelli* in Sandhouse's (1939) key, agreeing reasonably well with her description of that species. Comparison of the ten males with the holotype and male paratype of *O. bridwelli* show all 12 specimens to be morphologically alike. *O. bridwelli* Sandhouse, 1939, as Timberlake evidently earlier concluded, is therefore the likely missing male, and junior synonym, of *O. cara* Cockerell 1910, and it may be distinguished from the males of other large, montane "*Monilosmia*" by the differentiating attributes listed above. However, apart from DNA testing, certainty of that synonymy depends upon discovery of either a nest of *O. cara* containing both male and female offspring, or of a bilateral gynandromorph of *O. cara*. The finding of one or two mated pairs of which the female is *O. cara* would not prove the specific identity of the two sexes involved, for cross matings do occur among bees (Shinn 1967). For example, I have captured and preserved three copulating pairs in each of which the female is *O.* (*Osmia*) *ribifloris biedermanii* Michener and the male is *O.* (*Monilosmia*) *densa pogonigera* Cockerell.

[4] According to Dr. Norman Penny, specimens of *O. cara* in the collection of the California Academy of Sciences are from Walla Walla Co., Washington; Washoe Co., Nevada, and California counties of Siskiyou, Trinity, Butte, Plumas, Nevada, Napa, Contra Costa, Tuolomne, Santa Clara, Stanislaus, Fresno, and Tulare; to these may be added: Inyo (Timberlake Collection), Sacramento, Marin, Mariposa, Madera, Kern, Los Angeles, San Bernardino, Riverside, and San Diego counties (Moldenke and Neff 1974). It has also been taken in Emery, Wayne, Garfield and Kane counties, Utah (Dr. Terry Griswold).

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